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| 10/082,113 | 02/26/2002 | Shoichi Hirota | 500.41256X00 | 3518 |

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| EXAMINER | |
|---|---|
| DI GRAZIO, JEANNE A | |

| ART UNIT | PAPER NUMBER |
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| 2871 | |

DATE MAILED: 04/19/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

H·A

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/082,113 | HIROTA ET AL. | |
| | Examiner | Art Unit | |
| | Jeanne A. Di Grazio | 2871 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *RCE 27 Jan. 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1,3-16 and 18-37* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,3-16 and 18-37* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *26 February 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

## DETAILED ACTION

### *Claims*

Independent claims 1 and 16 have been amended. Dependent claims 2 and 17 have been canceled. Claims 1, 3-16 and 18-37 are pending.

### *Priority*

Priority to Japanese Patent Application No. 2001-298974 (Sept. 28, 2001) is claimed.

### *Continued Examination Under 37 CFR 1.114*

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on January 27, 2005 has been entered.

*Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1, 13 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over United States Patent 6,295,109 B1 (to Kubo et al.) in view of United States Patent Application No. US 2002/0047968 A1 (to Yoshida et al.).

As to claims 1 (amended) and 16 (amended): Kubo teaches and discloses a liquid crystal display device with a plurality of pixels having reflective and transmissive regions. That is, Kubo applies to reflective and transmissive displays (Column 1, Lines 10-24). Kubo has a reflective electrode region (reflection substrate), a transmissive electrode region (transparent substrate), liquid crystal (LC layer) in between the two substrates and a plurality of pixel electrodes switched by switching elements (TFTs)(See Column 9, Lines 15-37)(See also Figure 2).

The above are general conventional components of a reflective or transmissive display.

Kubo does not appear to explicitly specify that "an optical axis of an incident light beam upon the liquid crystal layer and an optical axis of an emergent light beam from the liquid crystal layer are present in a plane which is substantially perpendicular to a direction of orientation of liquid crystal molecules on the two substrates, the incident light impinges upon the liquid crystal layer in a direction which is inclined by a predetermined angle to the direction of the normal line of the substrate and a direction of polarization of the incident light beam upon the liquid crystal layer is substantially perpendicular or parallel to the direction of the orientation of the liquid crystal molecules."

However, Yoshida teaches and discloses a liquid crystal display device wherein the liquid crystal material has the following characteristics: the liquid crystal molecules are essentially parallel to the substrate surface in the absence of an applied voltage, the molecules have a slight pre-tilt, and they have a zero degree twist [Yoshida at 0031].

Yoshida incorporates the above noted liquid crystal material into the Yoshida invention for improved viewing angle characteristics, high response speed, and low cost [0010].

In Applicant's enabling disclosure (with reference to Figure 1A to which the claimed embodiment applies) Applicant sets forth the criteria for the liquid crystal material used in the invention. The Specification states: "The orientated states of the liquid crystal molecules ... is substantially parallel to the substrates, and is homogenous, having a twist angle of about 0. The liquid crystal molecules ... are oriented being slightly inclined with respect to the substrates, that is, it has the so-called pre-tilt angle." (Specification at page 10).

The above criteria for the liquid crystal material results in the structure of Figures 1A and 1B. The above criteria for the liquid crystal material result in "an optical axis of an incident light beam upon the liquid crystal layer and an optical axis of an emergent light beam from the liquid crystal layer are present in a plane which is substantially perpendicular to a direction of orientation of liquid crystal molecules on the two substrates, the incident light impinges upon the liquid crystal layer in a direction which is inclined by a predetermined angle to the direction of the normal line of the substrate and a direction of polarization of the incident light beam upon the liquid crystal layer is substantially perpendicular or parallel to the direction of the orientation of the liquid crystal molecules."

Because the material used in Yoshida is the same liquid crystal material used by Applicant, then, the Yoshida material must therefore exhibit "an optical axis of an incident light beam upon the liquid crystal layer and an optical axis of an emergent light beam from the liquid crystal layer are present in a plane which is substantially perpendicular to a direction of orientation of liquid crystal molecules on the two substrates, the incident light impinges upon the liquid crystal layer in a direction which is inclined by a predetermined angle to the direction of the normal line of the substrate and a direction of polarization of the incident light beam upon the liquid crystal layer is substantially perpendicular or parallel to the direction of the orientation of the liquid crystal molecules."

It would have been obvious to one of ordinary skill in the art of liquid crystals at the time the invention was made to modify Kubo in view of Yoshida for improved viewing angle, high response speed and low cost.

As to claim 13, Because Yoshida teaches and discloses Applicant's claimed liquid crystal material criteria, then, the limitation of "the optical axis of the incident light beam upon the liquid crystal layer is present in a plane which is substantially perpendicular to one of the directions of the orientation of the liquid crystal molecules in the two states ; and the incident light beam impinges upon the liquid crystal layer in a direction which is inclined by an predetermined angle to the direction of the normal line of the substrate."

Please note that Kubo discusses the application of an electric field to the liquid crystal material (entire patent).

Claims 3-6, 18-21, 30, and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over United States Patent 6,295,109 B1 (to Kubo et al.) in view of United States Patent Application No. US 2002/0047968 A1 (to Yoshida et al.) and further in view of United States Patent 6,542,211 B1 (to Okada).

As to claims 3, 4, 18, and 19: Kubo does not appear to explicitly specify homogeneous and homeotropic orientations.

Okada has an LCD device and driving method and homogeneous and homeotropic LC orientations (Column 3, Lines 16-40). In Okada, these alignments are useful for providing an LCD with a lower re-bending voltage and lower holding voltage for holding or retaining bend alignment (Column 1, Lines 64-67).

It would have been obvious to one of ordinary skill in the art of liquid crystals at the time the invention was made to modify Kubo in view of Okada for a lower re-bending voltage and lower holding voltage.

As to claims 5, 6, 20, and 21: It may be implied in Yoshida, that an angle between an optical axis of an optical path in the LC layer and the direction of the normal line of the substrate is set to be larger than a total reflection angle upon emanation of the light beam from the substrate into the air given the same liquid crystal material is used in both Yoshida and Applicant's claimed invention.

As to claims 30 and 31: Because Yoshida teaches and discloses Applicant's claimed liquid crystal material criteria, then, the limitation of "the optical axis of the incident light beam upon the liquid crystal layer is present in a plane which is substantially perpendicular to one of the directions of the orientation of the liquid crystal molecules in the two states ; and the incident light beam impinges upon the liquid crystal layer in a direction which is inclined by an predetermined angle to the direction of the normal line of the substrate."

Claims 7, 8, 22, and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over United States Patent 6,295,109 B1 (to Kubo et al.) in view of United States Patent Application No. US 2002/0047968 A1 (to Yoshida et al.) in view of United States Patent 6,542,211 B1 (to Okada) and further in view of Kitagishi Nozomi (JP-07-318861).

As to claims 7, 8, 22, and 23: Kubo does not appear to explicitly specify that an angle between an optical axis of an optical path in the LC layer and the direction of the normal line of the substrate is set to be not less than a Brewster angle between the substrate and the air.

Nozomi has a polarizing element and projector for which incident light is approximately the same as a Brewster angle with an optical axis (PAJ). In Nozomi, this configuration is used for polarizing and light separating efficiency.

It would have been obvious to one of ordinary skill in the art of liquid crystals at the time the invention was made to modify Kubo in view of Nozomi for polarizing and light separating efficiency.

Claims 9-12, and 24-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over United States Patent 6,295,109 B1 (to Kubo et al.) in view of United States Patent Application No. US 2002/0047968 A1 (to Yoshida et al.) in view of United States Patent 6,542,211 B1 (to Okada) and further in view of United States Patent 6,473,144 B1 (to Ichikawa et al.).

As to claims 9-12, and 24-27: Kubo does not appear to explicitly specify a hologram element (or diffraction grating) for pixels whereby p-polarized light is not substantially diffracted, but an s-polarized light beam generated after modulation by the LC layer is diffracted to a direction substantially perpendicular to the LC element.

Ichikawa has a hologram color filter including a blazed holographic diffraction grating for a hologram that has both a dispersing and converging function or only a dispersing function (Col. 3, Lines 45-53). In Ichikawa, s-polarized light is incident on the hologram color filter (Col. 4, Lines 55-56) and appears to be substantially perpendicular to the LC element (Figure 1). In Ichikawa, the hologram color filter diffractively disperses incident light to emanate light rays in different wavelength regions at a predetermined spatial period (Col. 2, Lines 53-65) for excellent color reproduction and to prevent uneven color (Col. 5, Lines 5-8).

It would have been obvious to one of ordinary skill in the art of liquid crystals at the time the invention was made to modify Kubo in view of Ichikawa for excellent color reproduction and to prevent uneven color.

Claims 14, 15, 32, and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over United States Patent 6,295,109 B1 (to Kubo et al.) in view of United States Patent Application No. US 2002/0047968 A1 (to Yoshida et al.) and further in view of Tanaka (US 5,895,108).

As to claims 14, 15, 32, and 33: Kubo does not appear to explicitly specify ferroelectric and antiferroelectric material to be used as the liquid crystal material.

Tanaka suggests that an antiferroelectric and ferroelectric liquid crystal may used because they require a low voltage when switching among antiferroelectric and ferroelectric states (Col. 2, Lines 45-63).

It would have been obvious to one of ordinary skill in the art of liquid crystals at the time the invention was made to modify Kubo in view of Tanaka for reduced drive voltage when switching among various liquid crystal states.

Claims 28 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over United States Patent 6,295,109 B1 (to Kubo et al.) in view of United States Patent Application No. US 2002/0047968 A1 (to Yoshida et al.) in view of United States Patent 6,542,211 B1 (to Okada) and further in view of United States Patent 6,417,941 B1 (to Inoko).

As to claims 28 and 29: Kubo does not appear to explicitly specify incident and emergent side hologram elements where the incident side hologram diffracts an emergent light beam substantially perpendicular to a substrate and an emergent side hologram diffracts the emergent light beam having a polarization orthogonal to the polarization of the incident light beam.

Inoko has a component of light passing through the first hologram element after diffraction and the polarization directions are perpendicular to each other (Col. 2, Lines 10-31).

Inoko has such a configuration for splitting of light with high accuracy and to prevent the unnecessary absorption of light that may internalize to heat (Id.). Such a display is reliable and has a long service life (Id.).

It would have been obvious to one of ordinary skill in the art of liquid crystals at the time the invention was made to modify Kubo in view of Inoko for accurate light splitting without the unnecessary absorption of light and for a display that is reliable and that has a long service life.

Claims 34-37 are rejected under 35 U.S.C. 103(a) as being unpatentable over United States Patent 6,295,109 B1 (to Kubo et al.) in view of United States Patent Application No. US 2002/0047968 A1 (to Yoshida et al.) and further in view of United States Patent 5,729,306 (to Miyake et al.).

As to claims 34-37: Kubo does not appear to explicitly specify a color separation and color synthesizing optical system; however, Miyake has a light splitting and synthesizing device as illustrated, for example, in Figure 18. In Miyake, the light source optical axis and projection lens are on different levels and parallel (Figure 18 and Figure 35).

Miyake has a polarized beam splitter for splitting a white light into polarized beams having polarizations different from each other (Col. 4, Lines 49-54) corresponding to three primary colors (Col. 17, Lines 44, 51, and 60) and the colors are incident on the LCD panels (Figure 18, LCDs 222, 223, and 224) obliquely on hologram plates (Figure 14).

In Miyake, the invention is directed to a light splitting and synthesizing device for aligning different polarization directions of the light emitted by a light source to prevent

chromatic aberration and for a high luminance display that is small and easy to produce (Col. 6, Lines 35-42).

It would have been obvious to one of ordinary skill in the art of liquid crystals at the time the invention was made to modify Kubo in view of Miyake for a splitting and synthesizing device requiring a low drive voltage that can be manufactured easily and that prevents chromatic aberration.

***Response to Arguments***

Applicant's arguments with respect to claims 1 and 16 have been considered but are moot in view of the new ground(s) of rejection.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jeanne A. Di Grazio whose telephone number is (571)272-2289. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robert Kim can be reached on (571)272-2293. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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